

of Jersey City were damaged to the extent of \$10,000. At Plainfield a substantial stone bridge over Green brook was washed away.

At Elizabeth, on the 23d, the water in the streets was knee-deep, flooding many of the houses. Barns and small buildings in some localities were floated away.

Moorestown: From the 21st to 24th, nearly all of the mill-dams in this vicinity were washed away; numerous and extensive washouts occurred on the railroad.

New York: New York City, 23d, six brick buildings in course of construction were undermined and fell, causing a loss of \$10,000. Many basements and cellars were flooded, causing great damage.

Sing Sing, 23d, washouts occurred along the railroad and travel was considerably delayed. The station was surrounded by water and many cellars were flooded.

Poughkeepsie, 23d, reports from the interior of the counties along the Hudson river state that roads were badly washed; the lowlands flooded and bridges were swept away.

Newburgh, 27th, many bridges have been swept away or damaged in this vicinity, and the new railroad station at this place was considerably damaged. Many cellars were flooded, causing much damage to merchandise.

At Cornwall, eight bridges were washed away, entailing a loss of \$12,000.

At Mountainville, a barn and dam were carried away, and a flour mill was damaged.

Port Jervis, 23d, trains have been delayed by washouts in the Ramapo valley; the tracks are submerged in places.

Pennsylvania: Philadelphia, 22d, damage to the extent of several thousand dollars has been done in and about the city; bridges, drains, and culverts were badly damaged. On the 23d, the Schuylkill river rose six feet. Much damage is reported to have been done at various points along the railroads. Reading, 23d, many cellars were flooded and the country roads are rendered impassable. Many hay-stacks have been swept away and some stock has been drowned. Newtown, 23d, several buildings were washed away and others were injured. Washouts occurred on the railroads in this vicinity.

Virginia: Fredericksburg, 23d, in Essex county four mills were washed away and great damage was done to crops and other property.

North Carolina: Tarboro', 22d, the heaviest rainstorm since 1842 occurred last night, sweeping away many bridges. The track of the Tarboro branch of the Wilmington and Weldon railroad was much damaged. Charlotte, 14th, serious washouts have occurred on the various railroads in this vicinity.

Texas: San Antonio, 6th, during a heavy rainstorm the streets were flooded. The San Antonio river rose eight feet, causing much damage to houses in the lower part of the city. The San Pedro creek, passing through the western part of the city, rose rapidly washing away all the bridges and houses on its banks. Several bridges were washed away on the International railroad and the track was much damaged.

Austin, 6th, Barons creek, south of this city has overflowed the farms on its banks, and fences and crops have been washed away. A flouring mill on the creek was destroyed, and another was badly damaged. The damage caused will amount to several thousand dollars.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at the Signal Service stations, with the average depth at which observations were taken, is given in the table on the right-hand of chart number ii. In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the same period.

The following table gives the highest and lowest temperatures of water at the several stations, with the range of water temperature, and the mean temperature of the air at the station, and the depth of water at which the observations were taken.

The greatest ranges occurred as follows: 22° at Provincetown; 18° at Chincoteague and Galveston; and 17.6° at Alpena. The smallest are: 2.07° at Eastport; 3° at San Francisco; 3.02° at Key West; and 5° at Marquette and Punta Rassa.

Temperature of Water for September, 1882.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City.....	73.9	68.0	5.9	ft. in.	69.1
Alpena.....	69.8	52.2	17.6	11 8	58.1
Augusta.....	83.5	68.5	15.0	9 10	74.6
Baltimore.....	78.0	68.0	10.0	10 1	69.0
Block Island.....	67.4	59.4	8.0	8 2	64.3
Boston.....	64.5	56.0	8.5	25 0	62.7
Buffalo.....	73.8	63.5	10.3	9 11	62.2
Burlington.....	73.3	60.0	13.3	17 0	60.1
Cedar Keys.....	87.0	80.0	7.0	10 6	79.2
Charleston.....	84.1	73.9	10.2	41 10	78.5
Chicago.....	72.8	62.8	10.0	8 2	65.0
Chincoteague.....	80.0	62.0	18.0	6 6	70.5
Cleveland.....	75.7	59.7	16.0	14 0	64.0
Detroit.....	74.0	62.0	12.0	24 3	64.2
Duluth.....	67.0	58.0	9.0	15 0	58.5
Delaware Breakwater.....	74.3	64.5	9.8	6 6	69.8
Eastport.....	60.4	47.7	12.7	16 3	56.0
Esanaba.....	66.0	61.8	4.2	15 0	63.2
Galveston.....	86.0	68.0	18.0	14 10	78.3
Grand Haven.....	71.5	57.0	14.5	19 0	62.2
Indianola.....	85.4	74.1	11.3	9 9	78.2
Jacksonville.....	87.0	79.0	8.0	15 0	77.8
Key West.....	87.0	83.8	3.2	16 3	82.2
Mackinac City.....	67.0	57.4	9.6	13 0	58.6
Marquette.....	61.8	56.8	5.0	10 6	56.9
Milwaukee.....	71.0	62.0	9.0	8 0	62.7
Mobile.....	81.5	77.0	4.5	15 0	75.7
New Haven.....	74.2	59.2	15.0	15 3	64.5
New London.....	69.0	61.0	8.0	12 6	64.8
Newport.....	68.9	59.7	9.2	10 1	64.6
New York.....	74.5	63.0	11.5	22 6	66.9
Norfolk.....	81.0	67.0	14.0	17 6	72.1
Pensacola.....	84.6	76.3	8.3	18 4	75.3
Portland, Me.....	60.0	63.5	3.5	20 1	61.7
Portland, Oreg.....	66.2	60.3	5.9	65 10	59.4
Port Eads.....	52.8	78.3	25.5	9 5	78.6
Provincetown.....	70.0	48.0	22.0	14 0	62.4
Punta Rassa.....	88.0	88.0	0.0	11 11	79.6
Sandusky.....	74.2	60.1	14.8	10 0	65.6
Sandy Hook.....	72.5	66.0	6.5	1 10	68.6
San Francisco.....	60.5	57.5	3.0	32 1	58.6
Savannah.....	82.8	73.4	9.4	13 5	77.1
Smithville.....	82.0	70.0	12.0	10 0	73.5
Toledo.....	73.5	63.5	10.0	11 8	64.2
Wilmington.....	81.5	71.5	10.0	13 0	74.0

*Observation not taken on 14th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were of frequent occurrence during September. The display on the evening of the 11th was the most important of the month, and was observed from the lower lake region westward to Dakota and southward to Virginia and southern Illinois. None of the displays noted were remarkable for their brilliancy or extent of observation. On the various dates they were reported as follows:

2d: Halifax, Nova Scotia.

3d: Duluth, Minnesota, faint auroral light from 9:15 to 9:25 p. m. Mackinac City, Michigan, pale auroral light at 9:00 p. m., lasting forty-five minutes.

4th: Deadwood, Dakota, faint auroral light, with occasional beams extending upward to an altitude of from 40° to 60°. It was first observed at 8:00 p. m., and disappeared at 11:00 p. m. Saint Vincent, Minnesota, faint auroral display from 10:00 p. m. to midnight. Marquette, Michigan, faint aurora from 9:10 to 9:40 p. m. Franklin, Wisconsin, faint auroral display from 9:00 to 10:00 p. m. Alpena, Michigan, aurora visible at 9:30 p. m., consisting of a diffuse light in the northern sky, with a few small streamers reaching an altitude of 60°. Cambridge, Massachusetts, distinct aurora observed at 10:15 p. m. Monticello, Iowa, aurora observed at 10:00 p. m. This display was also observed at the following Canadian stations: Toronto, Fredericton, and Halifax.

5th: Moorhead, Minnesota, faint aurora from 9:00 to 10:00 p. m. Franklin, Wisconsin, faint display from 9:00 to 10:00 p. m. Alpena, Michigan, diffuse auroral light with no streamers at 9:50 p. m. Rochester, aurora from 9:45 to 11:45 p. m., consisting of a few short faint beams shooting upward from a

dark and well defined segment. North Volney, New York, auroral streamers reaching an altitude of from 25° to 45° observed at 11:00 p. m. Mount Washington, an auroral display began at 10:40 p. m. and continued until early morning of the 6th. New Haven, auroral light visible in the northern sky from 11:00 p. m. until midnight. Thatcher's Island, Massachusetts, auroral arch of yellowish light with waving beams observed from 9:00 p. m., until 12:30 a. m. of the 6th; altitude from 20° to 50°; azimuth, 170° to 210°. Gardiner, Maine, bright auroral beams observed from midnight until after 1:00 a. m. of the 6th. Eastport, Maine, faint auroral light of pale yellow color, observed from 8:45 p. m., until morning of the 6th. Dyberry, Pennsylvania, a few auroral beams were observed near midnight. This display was also observed at the following Canadian stations: Toronto and Charlottetown.

6th: Burlington, Vermont, from 10:00 to 11:40 p. m., pale saffron-colored auroral light, with streamers in the north and northeast; no arch or segment visible. Hatteras, North Carolina, faint aurora of straw color observed at 12:55 a. m., which was soon after dissipated by the light of the moon.

7th: Mackinac city, Michigan, pale auroral display from 10:00 p. m. to 1:00 a. m. of the 8th.

8th: Burlington, Vermont, from 11:00 p. m. to 12:10 a. m. of the 9th, consisting of an indistinct arch, streamers, and a well-defined dark segment. Vevay, Indiana, faint crimson auroral light from 8:00 to 10:00 p. m. Toronto, Ontario, during evening.

9th: Vevay, Indiana, faint auroral light at 9:00 p. m.

11th: Fort Meade, Dakota, auroral display during the evening. De Soto, Nebraska, aurora during the evening. Beloit and Manitowoc, Wisconsin, observed during the evening. Swanwick, Illinois, auroral streamers at 9:00 p. m.; first visible from north to northeast, but later it extended westward and became a diffuse light over a dark cloud. The display ended at 10:00 p. m. Riley, Illinois, bright auroral arch of 12° altitude with a few rapidly moving streamers reaching upward 30°. The display ended at 10:00 p. m. Fort Brady, Michigan, aurora observed from 8:00 to 9:00 p. m. Northport, Michigan, aurora beams reaching an altitude of 50°, with dark clouds beneath, observed from 9:30 to midnight. Mackinac City, Michigan, auroral display consisting of two arches, the upper one extending across the sky from east to west through the zenith. At times the whole northern sky was illuminated by the aurora. Alpena, Michigan, brilliant auroral arch at 9:00 p. m., extending from northwest to northeast with streamers reaching an altitude of 70°. The streamers disappeared at 10:30 p. m., leaving a diffuse light resting on a dark segment. Thornville, Michigan, aurora first observed at 9:00 p. m., and soon after two arches were formed, the upper one being faint, after 9:30 p. m. the clouds broke up into luminous clouds and disappeared at 10:30 p. m. Lansing, Michigan, observed during the evening. Lafayette, Indiana, observed during the evening. Wabash, Indiana, faint aurora at 9:30 p. m. Westerville, Ohio, aurora from 9:00 to 10:30 p. m., consisting of a bright arch and streamers. Cleveland, Ohio, aurora visible from 9:00 to 10:00 p. m., consisting of bright stationary light of pinkish color in the northern sky. Erie, Pennsylvania, auroral beams reaching an altitude of 90°, visible from 8:35 to 10:20 p. m. Variety Mills, Virginia, strong auroral light observed between the clouds in the northern sky at 10:00 p. m. Toronto, Ontario, during evening.

12th: Tobacco Garden, Dakota, aurora observed through broken clouds at 8:20 p. m. De Soto, Nebraska, observed during the evening. Cambridge, Massachusetts, auroral streamers observed at 10:30 p. m.; at 11 p. m. the aurora was somewhat visible, but very faint. Woodstock, Vermont, faint auroral light at 10 p. m.

17th: Wicklow, Dakota, aurora observed during the evening.

18th: Sydney, Nova Scotia.

19th: Portland, Maine, faint auroral light from 2:00 to 3:00 a. m.

20th: Tobacco Garden, Dakota, faint aurora at 9:00 p. m., extending to an altitude of 20°, and covering about 55° of the horizon. De Soto, Nebraska, observed during the evening. Logansport, Indiana, auroral streamers above a dark cloud were observed during the evening. Spokane Falls, Washington territory, aurora observed at 4:19 a. m., and continued until the approach of day. It consisted of a small faint arch about 15° altitude, and covered about 30° of the northern horizon.

24th: Fort Madison, Iowa, during the evening.

26th: Saint Vincent, Minnesota, faint aurora from 10:25 to 11:00 p. m. Newport, Vermont, and Fort Madison, Iowa, during the evening.

30th: Charlottetown, Prince Edward Island.

THUNDER-STORMS.

Thunder-storms were reported in the various districts on the following dates:

New England: 3d, 4th, 5th, 7th, 8th, 9th, 11th, 14th, 18th to 23d.

Middle Atlantic states: 2d, 3d, 5th, 8th, 9th, 11th, 14th, 18th to 23d.

South Atlantic states: 1st to 11th, 18th, 19th, 21st, 22d, 23d, 25th, 27th.

Florida peninsula: 2d, 8d, 9th, 20th, 22d, 26th, 28th, 29th.

East Gulf states: 1st to 8th, 15th, 17th, 21st, 24th, 25th, 28th, 29th, 30th.

West Gulf states: 1st, 2d, 4th to 9th, 15th, 18th to 21st, 25th to 30th.

Rio Grande valley: 4th, 21st, 27th, 29th, 30th.

Ohio valley and Tennessee: 1st to 5th, 7th, 8th, 9th, 12th, 14th, 16th to 21st, 24th, 25th, 28th, 29th, 30th.

Lower lake region: 2d, 3d, 8th, 13th, 14th, 17th to 21st, 29th, 30th.

Upper lake region: 2d, 3d, 9th, 12th, 13th, 14th, 17th, 18th, 19th, 22d.

Extreme northwest: 4th, 7th, 8th, 11th, 18th, 19th, 25th, 26th.

Upper Mississippi valley: 1st, 2d, 3d, 8th, 9th, 10th, 13th, 16th to 20th, 24th, 25th, 26th, 28th, 29th.

Missouri valley: 1st, 2d, 5th, 9th, 16th to 20th, 23d, 24th, 25th, 27th to 30th.

Northern slope: 3d, 9th, 15th, 16th, 26th, 27th, 28th.

Middle slope: 1st, 3d, 7th, 14th, 18th, 19th, 16th, 27th, 36th.

Southern slope: 18th, 19th, 20th, 27th, 29th, 30th.

Southern plateau: 3d, 4th, 13th to 17th, 20th, 26th, 28th, 29th.

Northern plateau: 11th, 24th.

Middle Pacific coast region: 14th, 15th, 16th.

Thunder-storms also occurred at Campo, California, on the 14th, and at Havana, Cuba, on the 4th, and 11th.

During thunder-storms the following instances of damage by lightning have been reported:

Wakefield, Rhode Island, 9th: A building was struck and damaged by lightning, and three men were stunned.

New Haven, Connecticut, 8th: Several buildings were struck by lightning during thunder-storm. Reports from various points state that considerable damage was done by lightning during this storm.

On the summit of Mount Washington, on the 14th, a telephone and transmitter were badly damaged by lightning.

Yates Centre, Kansas, 27th: The post office building was struck by lightning.

Humboldt, Iowa, 4th: A stack of grain was struck and burned by lightning.

Dover, New Hampshire, 15th: A barn was struck by lightning and damaged to the extent of \$1,500.

New Market, New Hampshire, 22d: House struck and damaged by lightning.

New York, 15th: During the thunder-storm of last evening the lightning struck the Greenpoint oil works, at Kingsland and Meserole avenues, in Brooklyn, and Donnell's oil works, also, on Kingsland avenue, setting them both on fire. The Greenpoint works were totally destroyed by fire. The machin-

ery, with 60,000 barrels of oil in the works, were valued at \$80,000; and the damage to the Donnell's works is estimated at \$50,000.

Russell, Kansas, 27th: During thunder-storm a mule and rider were killed about nine miles south of station.

Bryant, Indiana, 18th: Two persons were killed by lightning, and another was seriously injured.

Pottsville, Pennsylvania, 8th: The principal of the high school, at this place, and three boys were severely stunned by lightning while crossing Lawson's Hill.

ELECTRICAL PHENOMENA.

On the summit of Mount Washington, on the 14th, at 8:45 p. m., the anemometer cups were illuminated with electric light. On the 19th, at 10:30 p. m., pointed objects were tipped with electric light.

Pike's Peak, 7th, during a heavy snow storm at 8:30 p. m., the anemometer cups revolved in a circle of light, and other objects were illuminated. The hair and clothing emitted sparks, and a peculiar aching sensation was felt in the fingers.

San Francisco, 15th, telegraph wires charged with atmospheric electricity.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England: 2d, 10th, 23d, 25th, 27th, 28th.

Middle Atlantic states: 1st, 9th, 10th, 17th, 19th, 24th, 27th.

South Atlantic states: 6th, 9th, 17th, 18th, 28th, 29th, 30th.

East Gulf states: 3d, 5th, 6th, 14th, 15th, 16th.

Ohio valley and Tennessee: 5th, 6th, 7th, 10th, 13th, 15th, 16th, 17th, 25th, 26th.

Lower lake region: 2d, 7th, 10th, 11th, 16th to 19th, 23d, 26th, 28th.

Upper lake region: 6th, 7th, 10th, 15th, 16th, 17th.

Upper Mississippi valley: 4th to 7th, 15th, 16th, 30th.

Missouri valley: 1st, 4th, 5th, 17th, 26th, 27th, 28th, 30th.

Solar halos were also reported from the following stations not included in the districts named above:

Punta Rassa, Florida, 6th, 18th.

Moorhead, Minnesota, 27th.

Tobacco Garden, Dakota, 24th.

Yates Centre, Kansas, 4th, 5th, 15th.

Clay Centre, Kansas, 26th.

Creswell, Kansas, 18th.

Salt Lake City, Utah, 4th.

Santa Fé, New Mexico, 2d, 11th, 24th, 29th.

Colfax, Washington territory, 29th.

Sacramento, California, 11th.

San Francisco, California, 1st, 2d.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England: 2d, 4th, 19th, 22d to 26th, 28th.

Middle Atlantic states: 2d, 4th, 22d, 23d, 26th, 27th.

South Atlantic states: 21st, 24th, 29th, 30th.

East Gulf states: 26th, 27th, 28th, 29th.

West Gulf states: 19th, 24th, 26th to 29th.

Ohio valley and Tennessee: 6th, 7th, 24th, 25th, 26th.

Lower lake region: 2d, 19th, 22d, 25th to 29th.

Upper lake region: 26th, 27th.

Extreme northwest: 24th to 27th, 29th.

Upper Mississippi valley: 21st, 22d, 24th to 27th, 29th, 30th.

Missouri valley: 24th, 25th, 26th, 28th, 30th.

Northern slope: 14th, 19th, 22d, 25th, 26th, 29th.

Northern plateau: 23d to 27th.

Lunar halos were also reported from the following stations not included in the districts named above:

Punta Rassa, Florida, 30th.

Havana, Cuba, 26th, 30th.

Uvalde, Texas, 28th.

Santa Fé, New Mexico, 24th 28th.

West Las Animas, Colorado, 29th.

Salt Lake City, Utah, 24th.

Los Angeles, California 27th.

MIRAGE.

Northport, Michigan, 20th: From 11:00 a. m. to 3:00 p. m., the opposite shore (twelve miles distant) appeared distinctly visible. Objects and localities were discernable and recognized, which could not otherwise have been seen.

Indianola, Texas, 1st to 4th, 23d, 25th, 26th.

Alexandria, Dakota, 21st, 23d.

Genoa, Nebraska, 1st.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and eighty-five stations show 5,459 observations to have been made, of which fifteen were reported doubtful; of the remainder, 5,444, there were 4,800, or 88.2 per cent., followed by the expected weather.

SUN SPOTS.

The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Massachusetts:

DATE— Sept., 1882.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
2, 2 p. m.	1	15†	0	0	0	0	5	26†	
3, 3 p. m.	0	10†	0	0	0	0	5	35†	
4, 1 p. m.	0	10†	1	5	0	0	4	45†	
5, 11 a. m.	0	0	0	0	0	0	4	45†	
7, 10 a. m.	0	0	1	10†	0	0	3	35†	
8, 10 a. m.	0	0	1	15†	0	0	2	20†	
9, 9 a. m.	1	2	0	0	1	2	3	20†	
10, 3 p. m.	0	0	0	0	0	0	3	20†	
12, 3 p. m.	1	1	0	10†	1	1	4	12†	
14, 8 a. m.	0	13†	0	5	1	13†	4	20†	Two spots quite large.
18, 3 p. m.	1	20†	0	0	0	0	3	35†	Two spots quite large.
19, 9 a. m.	0	0	0	0	0	0	3	35†	Two spots quite large.
20, 3 p. m.	0	0	0	0	0	0	3	35†	Two spots quite large.
23, 6 p. m.	1	2	0	0	1	2	4	25†	
24, 9 a. m.	1	1	0	2	1	1	4	25†	
28, 5 p. m.	1	15†	0	0	0	0	5	25†	Two spots very large.
29, 8 a. m.	0	5	0	0	0	0	5	30†	One spot very large.
30, 8 a. m.	0	0	0	0	0	0	5	30†	One spot very large.

†Approximated. Faculae were seen at the time of every observation.

Mr. H. D. Govey, at North Lewisburg, Ohio, reports: Sun-spots were observed on all clear days during the month. They were most numerous at the beginning and close of the month; largest and most active on the 28th; and smallest on the 12th.

Mr. David Trowbridge, at Waterburg, New York, reports: 2d, three groups, six spots; one group has appeared by rotation. 4th, four groups, thirteen spots. 6th, three groups, fifteen spots; one group has gone out since the 4th. 7th, three groups (same as 6th), twelve spots. 8th, two groups, six spots; one group has disappeared by rotation. 9th, three groups, eight spots; one faint spot surrounded with faculae has just appeared by rotation. 12th, two groups, six spots; all faint. 14th, three groups, five spots; one group has disappeared by rotation. 15th, one group, three spots; one group has disappeared by rotation, and one near the centre has gone out. 16th, one group, three spots; atmosphere hazy. 17th, two groups, nine spots. 19th, two groups, five spots; somewhat cloudy. 24th, three groups, four spots; one group has just appeared by rotation. 25th, four groups, eleven spots; one group has disappeared by rotation, and one has appeared by rotation; faculae in the west. 26th, four groups, seven spots; somewhat cloudy. 27th, three groups, six spots; faculae in the west. 30th, four groups, ten spots; one large group; faculae in the east.

Captain John Carroll, of the s. s. "Hevelius," reports: 5th, in N. 28°, W. 19°, observed a large spot on sun's disk, and 6th, in N. 31°, W. 17°, the same spot was observed.